How Certain Are You?

Reporting Category   Probability and Statistics

Topic   Predicting the likelihood of outcomes

Primary SOL   4.13   The student will
   a)   predict the likelihood of an outcome of a simple event; and
   b)   represent probability as a number between 0 and 1, inclusive.

Materials
- Chart paper
- Markers
- 3 x 16 inch strips of tag board
- Probability Statements handout (attached)
- Scissors
- Glue or tape

Vocabulary

possible outcome, event, predict, probability, impossible, unlikely, equally likely, likely, certain, fraction, least likely, most likely

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Display the words *certain, likely, unlikely,* and *impossible*. Discuss with students that some statements are completely certain or will definitely happen, other statements can be interpreted as "maybe," or "maybe not," while yet other statements are impossible or will never happen. On chart paper, write the four headings CERTAIN, LIKELY, UNLIKELY, and IMPOSSIBLE at the top of four columns. Make the columns wide because you are going to write the students' statements in them.

2. Ask students to help you fill the columns with statements that fit (e.g., under the CERTAIN heading, "Everyone in the class will be marked 'Present' today."; under the UNLIKELY heading, "All boys in the class will have green hair tomorrow."; under the IMPOSSIBLE heading, "All girls in the class will grow three inches overnight.") Continue until there are two or three statements in each column and students can easily see the differences among the categories. Some of the statements may be silly, but that will cause students to think critically about and evaluate the statements. Discuss the fact that it is possible to disagree about the categories into which some statements fit.

3. Tell the class that they are now going to evaluate a collection of statements and decide where those statements fit on a "probability line." Group students into pairs, and give each pair a 3 x 16 inch strip of tag board, a copy of the Probability Statements handout, a pair of scissors, and glue or tape. Have pairs divide their tag board strips into fourths, and instruct them to write one of the four headings listed above in each section of the strip. Then, have the pairs decide where each statement fits on the probability line and attach it under the agreed heading. If a pair of students do not agree on the category for a statement, the pair of students should try to come to a consensus while still disagreeing.

4. When all probability lines have been completed, ask student pairs to share their results for each statement. Lead a class discussion of the similarities and differences among the results.

Assessment
- **Questions**
  - o What does it mean for outcomes of an event to be "equally likely"? What kind of event would have outcomes that are equally likely? (Flipping a coin: it is equally likely that the outcome will be heads or tails.)
  - o What fractional representation can describe the likelihood of each of two possible equally likely outcomes of an event?
- **Journal/Writing Prompts**
  - o Write at least three probability statements for each category, and describe how difficult or easy it was to come up with these statements.

Extensions and Connections (for all students)
- Change the pairing of students, and repeat the activity. Compare results with the first trial to see whether they were basically the same. Notice whether there was as much discussion and/or problem solving the second time.
- Have students flip coins to determine the likelihood of heads or tails. Be sure they tally each flip.
- Have students create a large-scale probability line, using a clothesline. Have them place large cards with probability statements on them along the clothesline.
- Have students stand along a large-scale probability line (or under the probability line created by the clothesline) with sheets of paper displaying probability statements.

Strategies for Differentiation
- As a whole class, have students group statements according to their probability.
- Give each student precut copies of the Probability Statements in a bag or envelope, and have each student physically group them according to probability.

Probability Statements

It will rain tomorrow.
Pizza will be served for lunch today.
The sun will rise tomorrow.
You will have two birthdays this year.
Your teacher is over 18 years old.
At least two students in the class will be absent tomorrow.
You will ride in a bus before the end of the school year.
It will take you more than one hour to do your homework.
You will have homework tonight.
Your school has a principal.
You will go to bed before 9:00 tonight.
You will go to Disney World sometime.
You will get tails when you flip a coin.
You will throw a 4 on a die.
Your teacher will let you have an extra recess today.
On your way home from school, you will see a live dinosaur.